Measuring threat status

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Abstract: What does it mean if a species is “endangered and red-listed”? Using the example of the 2005 Red List of Amphibians, this article aims to demonstrate how a species’ threat status is assessed.

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Measuring biodiversity

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Cover (top to bottom):
1. Diverse micro-organisms (photo credit: Edward A. D. Mitchell); 2. Determining the diversity of fruit varieties (photo credit: ProSpecieRara Basel); 3. Archived butterfly diversity (photo credit: Beat Ernst Basel); 4. Biologists working in the field (photo credit: Edi Stöckli)

Red lists

Measuring threat status

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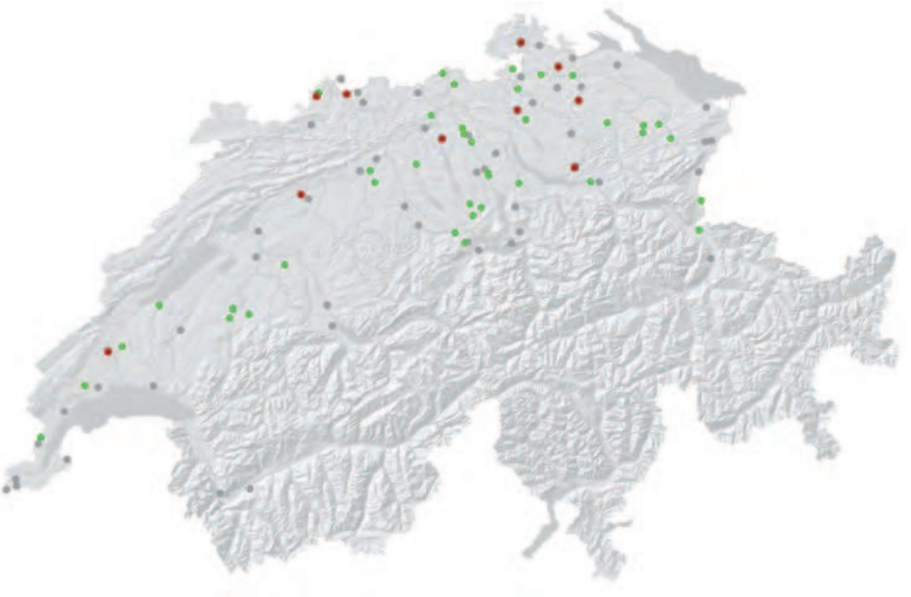
What does it mean if a species is "endangered and red-listed"? Using the example of the 2005 Red List of Amphibians, this article aims to demonstrate how a species' threat status is assessed.



The map shows, for the Yellow-bellied toad *(Bombina variegata),* the results of field work undertaken to update the red list. Green dots denote past records which were confirmed, while gray dots denote past records which could not be confirmed. Red dots denote new populations. Copyright: karch and Swisstopo.

The contracting authority of the 2005 Red List of Amphibians, the Swiss Federal Office for the Environment FOEN, specified that the methodology used by the World Conservation Union (IUCN) should be applied. The IUCN has defined both red list categories as well as quantitative criteria which determine to which of the categories a species is assigned. An examination of the IUCN's methodology showed that for amphibians native to Switzerland only the criteria "geographic range" and "declining population" can meaningfully be applied. As karch – Swiss Amphibian and Reptile Conservation Programme – maintains a distribution database which provides information on the number of populations of species of amphibians in Switzerland, and given that changes in the number of populations may be used to infer a population reduction, the "declining population" criterion appeared appropriate.

For all pond-dwelling species (except common species, namely the European common frog, European toad and Alpine newt), 25 breeding sites (i.e. populations) each were selected at random. As each of the breeding sites often hosts several species, the resulting sample sizes were in the order of 25 to 100 breeding sites per species. A total of 300 breeding sites of amphibians were sampled, each being visited four times by specialists. The aim was to record the amphibian species (still) present. Four visits were needed due to the species' phenology; these multiple visits also allowed an estimate of species' detection probability. The estimates of detection probability allowed calculation of the number of populations overlooked. It was shown that, thanks to the four visits to each site, practically no population remained undetected.

The calculations for the "declining population" criterion were based on the population decline as determined from field survey data. For example, if a species previously had 100 populations in the overall sample and only 50 populations could be confirmed it was deemed to have suffered a 50% population decline.

It would also have been possible to record a population increase. In addition to breeding sites in which the species had been recorded in the past, sites were included in the sample at which the species had not been observed in the past, including some newly created wetlands. If a species was recorded at breeding sites where it had not previously been present, this would indicate a population increase. However, relatively few such populations were detected and mostly only concerned common species such as the European common frog or Alpine newt.

The "effective range" was determined by first calculating the number of current populations (number of populations in database multiplied by population decline) and then determining the area inhabited by each of the populations. For frogs this area was taken to cover a circle with a radius of one kilometre while for newts an 0.5 kilometre radius was applied. The number of current populations multiplied by their individual range gives the species' "effective range" in Switzerland.

For a reliable estimate of population decline and range size, and to assign the species to IUCN red list categories, it is crucial that the karch database held good records of species distribution in Switzerland, that random sampling of populations in the field was undertaken, and that the data were analysed using modern statistical methods (also see the article on p. 8).